R-WD-03-37

2001 COASTAL MUNICIPAL STORMWATER INFRASTRUCTURE MAPPING PROJECT

A Final Report to

The New Hampshire Estuaries Project

Submitted by

Andrea F. Donlon
N.H. Department of Environmental Services
6 Hazen Drive
Concord, New Hampshire 03301

August 2003

This report was funded in part by a grant from the Office of State Planning, New Hampshire Estuaries Project, as authorized by the U.S. Environmental Protection Agency pursuant to Section 320 of the Clean Water Act.

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

New Hampshire Estuaries Project

TABLE OF CONTENTS

List of Tables

EXECUTIVE SUMMARY

The New Hampshire Department of Environmental Services (DES) received funds in 2001 from the New Hampshire Estuaries Project (NHEP) to provide assistance to coastal communities to develop storm sewer infrastructure maps. DES created maps of outfall pipes in several towns and administered grants to coastal municipalities to map their storm drainage systems. This final report describes the outfall mapping project and the grant projects. Outfall maps were created for New Castle, Newington, Portsmouth, and parts of Durham and Madbury. Grant projects were completed in Exeter, Hampton, Newmarket, and Somersworth. Seabrook completed the first phase of a grant project. Durham and Rochester forfeited grants awarded to them because the work could not be completed by the project deadline.

NHEP chose to fund stormwater infrastructure mapping projects for a number of reasons. Primarily, this grant was established in order to fulfill one of the water quality action plans identified in the NHEP Management Plan. In addition, the Coastal/Piscataqua watershed has been identified by DES as a priority watershed in need of restoration. A good map is an important part of identifying pollution sources in the storm drainage system. Finally, all of the communities that were awarded grants, except Newmarket, are regulated as small municipal separate storm sewer systems (MS4s) under the Phase II federal stormwater regulation. The financial assistance these municipalities received has helped them comply with one of the requirements of the new regulations.

INTRODUCTION

This final report describes a mapping project and grant program funded by NHEP and administered by DES. A Memorandum of Agreement (MOA) between NHEP and DES provided funding to map outfall pipes in the coastal area and created a grant program to provide assistance to coastal communities to develop storm sewer infrastructure maps. As part of the mapping project, DES collected global positioning system (GPS) readings of all outfall pipes in New Castle, Newington, Portsmouth, and parts of Durham and Madbury. For the grant project, DES issued a request for proposals (RFP), chose grant recipients, and managed the contracts. This report provides details on the grant projects completed by Exeter, Hampton, Newmarket, Seabrook, and Somersworth. The two grant projects that were terminated, Durham and Rochester, will not be discussed. The deadline for completion of all grant projects was June 30, 2003.

PROJECT GOALS AND OBJECTIVES

The goal of the project was to provide financial and technical assistance to coastal municipalities to map their storm drainage systems. The project's objective is derived from one of the Action Plans identified in the NHEP Management Plan relating to water quality (see www.state.nh.us/nhep/Mgtplan/mgtplan.htm). Action WQ-4B aims to assist Seacoast communities in completing and maintaining maps of sewer and stormwater drainage infrastructure maps. The grant summarized in this report was established to help carry out this action plan.

METHODS

On March 14, 2001, the Governor and Executive Council approved an MOA between the New Hampshire Office of State Planning and DES to implement several NHEP actions to improve the environmental quality of the state's estuaries, including funding for municipal stormwater infrastructure mapping.

Outfall Mapping Project

For this project, DES chose to produce maps for the municipalities that were to be regulated under the Phase II federal stormwater requirements but did not yet have municipal storm sewer system maps or impending projects to create such maps. The minimum requirement of the regulation is to have a map that shows the outfall locations and the bodies of water. DES thought that creating maps meeting the minimum requirements would help those municipalities comply with the regulations, at least until municipal officials decided to make more detailed maps. The regulated MS4s that did not yet have maps were Durham, Madbury, Newington, New Castle, and Portsmouth. [At the time, the list of regulated MS4s was based on the 1990 Census. In the summer of 2002, the list was updated to include information from the 2000 Census, but by that time this mapping project was complete].

In order to collect location information for each outfall pipe in the communities listed above, DES purchased a Trimble GeoExplorer 3 GPS unit using NHEP funding. DES also used NHEP funding to hire a summer intern, Rayann Richard. Her task was to find all outfall pipes and to collect GPS readings of the pipes. Field work was completed between June and August, 2001. The Trimble GPS unit allowed us to collect additional attribute information about each pipe as part of a "data dictionary." At each pipe, Rayann logged information such as the date, time, pipe size, construction material of the pipe, whether or not the pipe was flowing, whether or not the pipe was subject to tidal flows, and whether the pipe was accessed by boat or by foot. Dry weather and low tides were the best times to conduct this field work.

After each day in the field, Rayann downloaded available base station data in order to differentially correct the GPS data. Differential correction makes the readings more accurate by eliminating some of the errors inserted by U.S. military agencies. When all the data were compiled and cleaned up, DES geographic information system (GIS) staff converted the GPS data to a GIS coverage. All the data dictionary information was also converted to GIS. DES bought an ArcView license with NHEP funding and created outfall maps of Durham/Madbury, New Castle, Newington, and Portsmouth.

Grant Project

On September 24, 2001, DES issued a request for proposals (RFP) to all communities within Zone A of the coastal watershed (as designated in the NHEP Management Plan), announcing the availability of funds for storm drainage system mapping. The requirements for the use of the NHEP funds were as follows:

1. Maps should show catch basins, underground and above ground storm drainage, direction of flow, and outfall locations.
2. Maps must have the ability to be stored electronically, using a system that is compatible with the computer mapping system the municipality uses. Ideally, the system would also

be compatible with the NH GRANIT system, so that regional planning commissions and other interested parties can use the data.

3. The proposed project meets the eligibility criteria (see below).
4. Funding must be matched with a 40 percent local (non-federal) share in cash or in-kind services.
5. All projects must be completed by December 31, 2002. This final date was changed to June 30, 2003, in an amendment to the MOA approved by Governor and Council on December 4, 2002.

DES received proposals from Exeter, Durham, Newmarket, and Rochester by the deadline of November 13, 2001. Hampton and Somersworth had already submitted applications for storm drainage system mapping projects under a different NHEP grant program in early 2001. The Hampton and Somersworth projects were administered under this grant program and were already underway before the RFP was issued. DES reviewed the new proposals and assessed their merit based on the following criteria:

- Eligible municipalities include Dover, Durham, Exeter, Greenland, Hampton, Hampton Falls, Madbury, New Castle, Newfields, Newington, Newmarket, North Hampton, Portsmouth, Rochester, Rollinsford, Rye, Seabrook, Somersworth, and Stratham.
- Maps should be consistent with the town's GIS system and are encouraged to be compatible with the NH GRANIT system.
- A match of at least 40 percent of total project cost is required. Matching funds must be from a non-federal source. Cash and/or in-kind services are acceptable forms of match.

All of the grant applications were deemed to be acceptable projects. The amounts requested exceeded the $44,195 initially made available for the grant. In order to be able to fund all of the projects, the MOA was amended to increase the funding to $56,621. Contracts were developed for each project and approved by the town or city managers, the DES commissioner, and the Governor and Executive Council.

When Durham terminated its grant because it lacked municipal funding to complete a base map, the Seabrook project was substituted. Rochester terminated its grant in the last month of the contract because it would not be able to complete the work. It was too late to find a substitute use for the $8,996 that was awarded to them. The original deadline for all projects was December 31, 2002, but many of the projects took longer to complete than expected, and the MOA and individual contracts were amended to extend the deadline to June 30, 2003.

RESULTS AND DISCUSSION

The outcome of the mapping project and the activities performed as part of each grant are discussed in this section.

Outfall Mapping Project

ArcView maps of outfall pipes were created for Newington, New Castle, Portsmouth, and parts of Durham and Madbury. A map of North Mill Pond and Hodgson Brook in Portsmouth was also produced because DES has been involved in a restoration project for Hodgson Brook. These maps are shown in the Appendix.

The maps produced from the outfall mapping project were only mildly useful. Newington and Madbury have since gotten waivers from the U.S. Environmental Protection Agency, and thus are exempt from the Phase II regulations for the next five years. Durham was planning to complete a more detailed set of maps funded by the 2001 grant program, but budget constraints prevented the town from being able to contribute matching funds. Durham is pursuing a 2003 grant to map the municipal storm sewer system in town. Portsmouth has since received a 2002 mapping grant. DES supplied Portsmouth with the GIS coverage created in this project, and the data are being used as an additional source of "ground-truthing" of the information the city collects to complete the maps. The status of maps for New Castle is unknown. DES attempted to make contact with town officials, but was unable to determine whether maps were produced.

Exeter Grant

Exeter had existing storm drainage maps of the town, but several new developments had occurred since the system was mapped in 1996. The grant allowed the town to update its maps and purchase storm water database software so that officials can update maps themselves when as-builts are submitted and keep track of storm system maintenance.

Mapping was completed for the following areas:

- Downtown – The storm sewer and sanitary sewer systems were recently separated in the central core of the town and the map needed to reflect that change.
- Near Route 101 – Construction along Route 101 had resulted in changes to drainage along Portsmouth Avenue and the Route 88 connector. Drainage structures were located and mapped.
- New housing developments – Seven new housing developments were mapped as part of this grant.

To complete this work, the town prepared for the updates by making copies of the as-built plans that needed updates and by field verifying as-built plans. The town hired Cartographic Associates, Inc. (CAI) to provide geographic information system (GIS) mapping for this project. CAI produced updated color maps of the storm drainage system and also trained town employees to operate a global positioning system (GPS) unit and make future updates to the storm drainage systems themselves. The town reviewed the resulting maps for accuracy.

The grant also provided for training for a new storm water database software package that the town purchased from GBA Master Series, Inc. This software package will allow the town to keep track of maintenance of its storm and sanitary sewer systems. It is compatible with the town's ArcView maps and it runs on a Microsoft Access platform.

The grant amount for this project was $12,020. Exeter provided $8,524 in non-federal match.

Hampton Grant

Hampton started its project with no previous storm drainage system maps. After receiving the grant, the town selected VHB, Inc. to complete a GIS survey of Hampton's stormwater drainage system. The town assisted VHB in locating drainage structures, and worked to field-verify data and gather information such as pipe sizes and direction of flow. VHB created maps that overlay the town's tax parcel maps, and they trained town personnel to use the system and manipulate it so that they can do their own updates. They also created a system that is hot-linked to

photographs of outfall pipes. The town now has this GIS layer in ArcView software, and the data are available to the Conservation Commission, Assessors Office, Department of Public Works, and Planning Department. Town personnel report that they are now better able to cross-reference maintenance and repair records. They also have a quick reference tool to access storm drainage information, printing maps, and viewing outfalls.

The grant amount for this project was $9,000. Hampton provided $2,372 in non-federal match.

Newmarket Grant

Newmarket worked with the Strafford Regional Planning Commission (SRPC) to create digital maps of its storm drainage system. No previous maps or other records of the storm drainage system existed. Newmarket Highway Department and Public Works personnel worked with SRPC to locate all drainage features and collect information using a GPS device. These data were then exported to GIS data layers and mapped. SRPC created a data layer that connected drainage features with lines, and the town staff field-verified flow direction and missing information. In total, the town documented 402 catch basins, 66 outfall pipes, 26 drainage manholes, 16 culverts, and one detention basin. As a result of this project, the town of Newmarket will develop a process to update the storm drainage system mapping as part of a plan to improve management of the storm drainage system. The town will use and update the drainage data in ArcView GIS software.

The grant paid for $7,496.99 of this project. Newmarket provided $7,497 in non-federal match.

Seabrook Grant

Seabrook was awarded a mapping grant using funds from 2001 (leftover when Durham terminated their grant) and 2002. Phase 1 of the mapping project was completed by the June 30, 2003 deadline. The town hired Earth Tech to complete the mapping project. Earth Tech has worked to convert paper records into electronic data, and they have used the town's April 2001 aerial photographs to obtain surface utility data and compare those data against the digitized data. In the second phase of the project, Earth Tech will populate the database with known information and identify gaps that need to be filled through field activities.

The grant amount for this phase of the project was $5,605. Seabrook provided $5,605 in non-federal match.

Somersworth Grant

The City of Somersworth used the grant to cover part of their contracting expenses. Somersworth hired Lockwood Mapping to digitize aerial photographs of the city (shot in 1999) and create a digital base map and storm drainage system map in the central part of the city. The grant paid for only 15 percent of the total project costs. As part of their extensive match, the city hired an intern to compile all the old paper maps and to inspect the drainage system. The city bought a smoke machine, which was used to identify inflow/infiltration problem areas. [The smoke machine has also been useful in illicit detection work]. City staff verified infrastructure shown on city maps and made corrections as needed. They also collected information on the condition of covers, grates, surrounding pavement, depth of structures, depth of flow (if any), pipe sizes, and direction of flow. These data were put into a Microsoft Access database for

eventual inclusion in a city-wide integrated GIS system. City staff also located and inventoried all known outfalls to the Salmon Falls River. The finished product is in AutoCAD format.

The grant amount for this project was $10,000. Somersworth provided $55,468.11 in non-federal match.

CONCLUSIONS AND RECOMMENDATIONS

While the outfall mapping project was not as helpful to coastal communities as DES had hoped, the grant was instrumental in getting several communities to develop accurate and detailed maps of their storm drainage infrastructure. In most cases, these maps are the first compilation of drainage structures the municipality has ever had. Water quality improvements will likely come as one of the many benefits to having such maps – they are very helpful when tracking down non-stormwater discharges into the storm drainage system.

The grant has also assisted regulated small MS4s in complying with federal Phase II stormwater requirements. Many municipalities have complained that this regulation presents a strain on tight municipal budgets; offering money helps alleviate some of those concerns. The grant has also fostered positive relationships between municipalities and DES. Table 1 summaries the final project costs under this grant.

Table 1. 2001 Coastal Municipal Stormwater Infrastructure Mapping Grant Project Costs

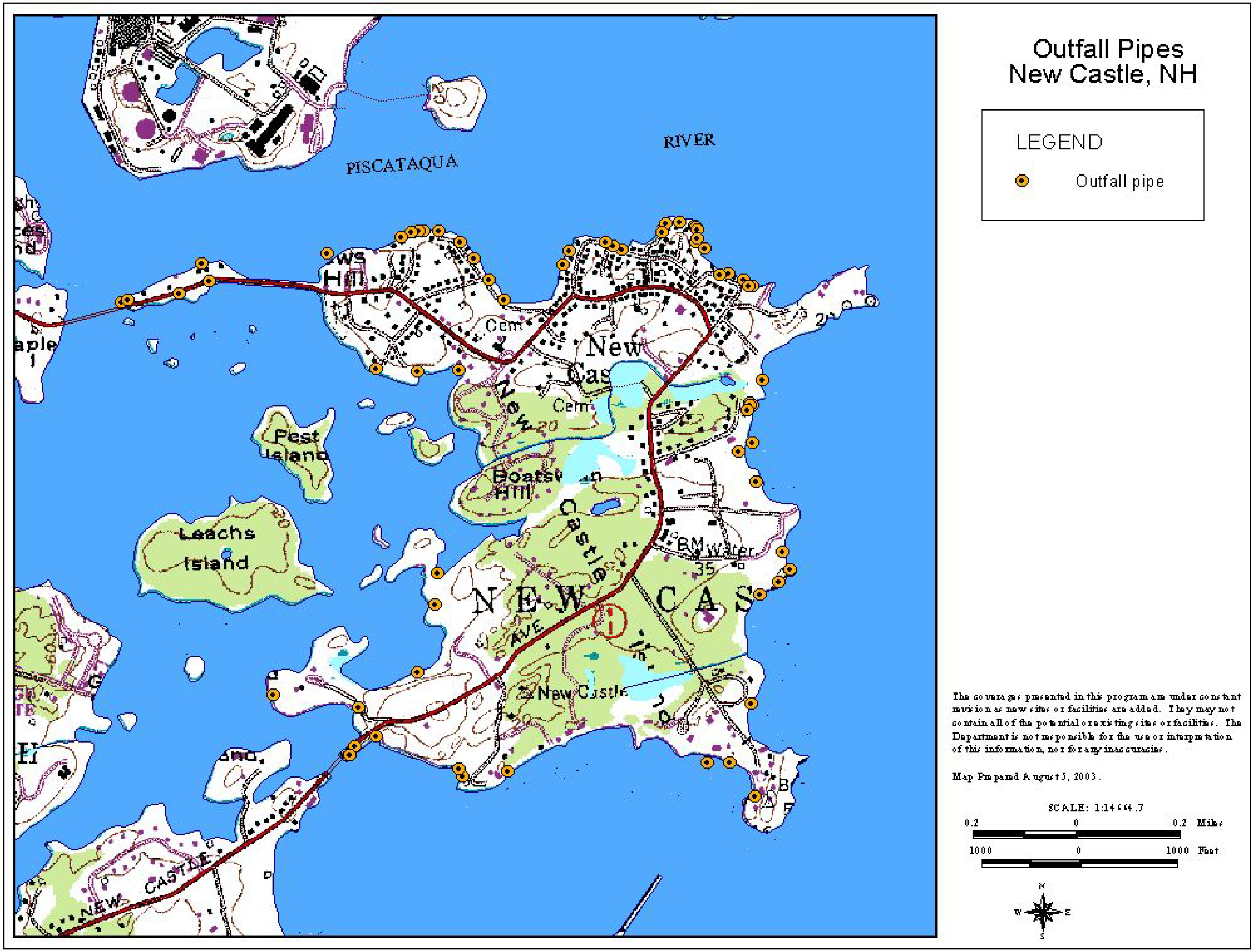
Grant recipient	Grant amount	Match amount	Total project cost
Exeter	$11,425.00[1]	$8,524.00	$19,949.00
Hampton	$9,000.00	$2,372.00	$11,372.00
Newmarket	$7,496.99[2]	$7,497.00	$14,993.99
Seabrook	$5,605.00	$5,605.00	$11,210.00
Somersworth	$10,000.00	$55,468.11	$65,468.11
Total	**$43,526.99**	**$79,466.11**	**$122,993.10**

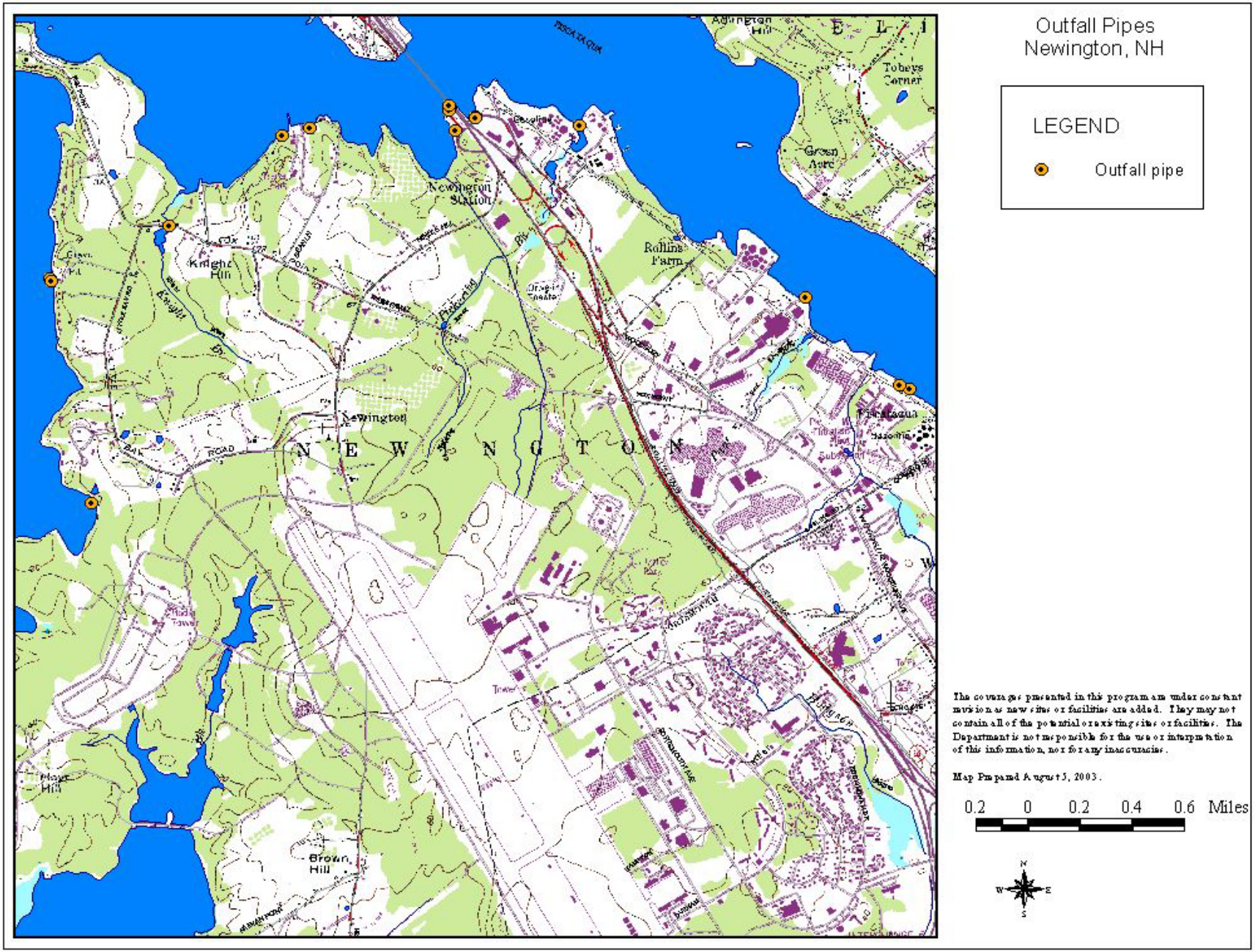
Notes:
[1] Contract grant amount was $12,020.00, but Exeter project ran under budget.
[2] Contract grant amount was $8,996.00, but Newmarket supplied more match than expected.

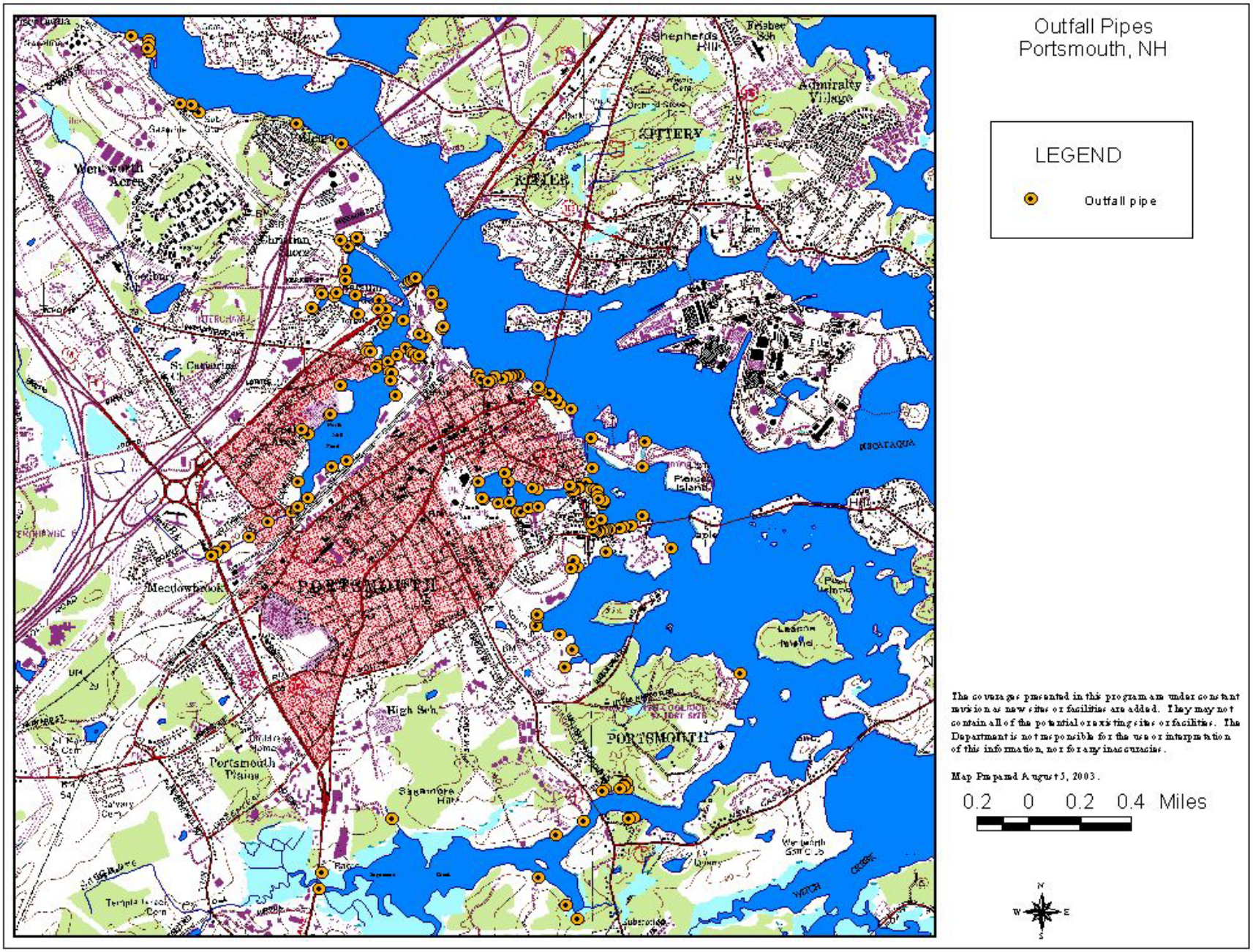
Based on the experience of the 2001 grant, the following changes are recommended for future grant opportunities with NHEP.

- A longer contract period is desirable. Given the time it takes to issue a request for proposals, approve the projects, draw up contracts, and go through the lengthy Governor and Council approval process, it frequently does not give municipalities enough time line up their match, hire a contractor, and complete the work.
- Additional funding for this grant is recommended until most communities in the coastal watershed have adequate maps. This grant was viewed very positively by communities, and there is continued interest, particularly among regulated MS4s, for the grant to be offered again.

APPENDIX: OUTFALL MAPS PRODUCED BY DES


Outfall Pipes
New Castle, NH
LEGEND
Outfall pipe
PISCATAQUA
RIVER
Pest Island
Leachs Island
New Castle
NEW CAS
The coverages presented in this program are under constant revision as new sites or facilities are added. They may not contain all of the potential or existing sites or facilities. The Department is not responsible for the use or interpretation of this information, nor for any inaccuracies.
Map Prepared August 5, 2003.
SCALE: 1:14644.7
0.2 0 0.2 Miles
1000 0 1000 Feet


Outfall Pipes
Newington, NH
LEGEND
Outfall pipe
N E W I N G T O N N H
Newington
Newington Station
Rollins Farm
Knight Hill
Brown Hill
Tobeys Corner
Green Acre
Pierce Island
The coverages presented in this program are under constant revision as new sites or facilities are added. They may not contain all of the potential or existing sites or facilities. The Department is not responsible for the use or interpretation of this information, nor for any inaccuracies.
Map Prepared August 5, 2003.
0.2 0 0.2 0.4 0.6 Miles
N
W
E
S


Outfall Pipes
Portsmouth, NH
LEGEND
Outfall pipe
The coverages presented in this program are under constant revision as new sites or facilities are added. They may not contain all of the potential or existing sites or facilities. The Department is not responsible for the use or interpretation of this information, nor for any inaccuracies.
Map Prepared August 5, 2003.
0.2 0 0.2 0.4 Miles
N
W
E
S

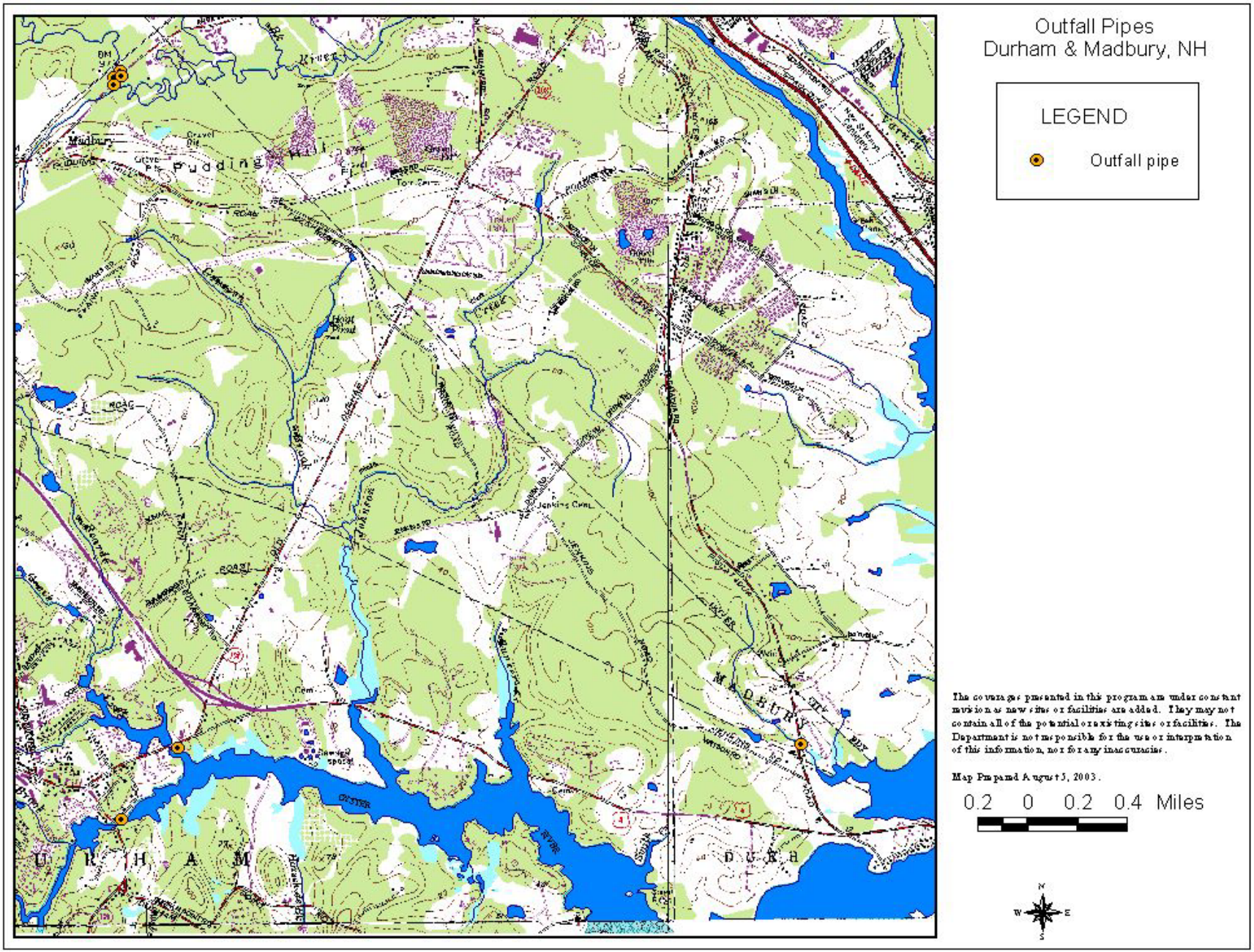
Hodgson Brook Portsmouth, NH

Prepared by NHDES May 3, 2002

N

0.25 0 0.25 0.5 Miles

- Indicates location of storm drainage outfall


Outfall Pipes
Durham & Madbury, NH
LEGEND
Outfall pipe
Madbury
Pudding Hill
Jenkins Cem.
MADBURY
DURHAM
OYSTER
RIVER
The coverages presented in this program are under constant revision as new sites or facilities are added. They may not contain all of the potential or existing sites or facilities. The Department is not responsible for the use or interpretation of this information, nor for any inaccuracies.
Map Prepared August 5, 2003.
0.2 0 0.2 0.4 Miles
N
W
E
S